

## **CAMELOBAETIDIUS VARIABILIS (EPHEMEROPTERA: BAETIDAE), A NEW SPECIES FROM TEXAS, OKLAHOMA AND MEXICO<sup>1</sup>**

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**ABSTRACT:** *Camelobaetidius variabilis*, new species, is described from larvae and from male and female adults. This species is common in the creeks and rivers of the hill country region of Texas and is also known from Oklahoma, and Nuevo Leon and Tamaulipas, Mexico. Characters are presented to separate the larvae of this species from *C. similis* and other related species.

Lugo-Ortiz and McCafferty (1995) presented a taxonomic review of the North and Central American species of the genus *Camelobaetidius* Demoulin. As a result of their study, many previously accepted species were found to be variants of more widespread species and two new species were described, namely *C. kondratieffi* Lugo-Ortiz & McCafferty and *C. similis* Lugo-Ortiz & McCafferty.

In 1996 specimens were collected by the author from the Guadalupe River in Texas that exhibited tarsal claw denticulation not typical of the only nominal species, *C. mexicanus* (Traver and Edmunds), reported in Texas (Allen and Chao 1978, Henry 1986, McCafferty and Davis 1992, McCafferty and Provonsha 1993, Lugo-Ortiz and McCafferty 1995). Upon further examination it was observed that these specimens had gills or osmobranchia on the pro- and mesothoracic segments. The presence of coxal gills on the middle coxae was previously unreported in this genus. *Camelobaetidius similis* described from Guerrero, Mexico, as well as other species known from Peru, do have thoracic gills on the prothorax. After examination of many specimens contained in my collection and the collection at the Brackenridge Field Laboratory of the University of Texas at Austin it became evident that this was an undescribed species. W. P. McCafferty and C. R. Lugo-Ortiz (Purdue University, West Lafayette, Indiana) confirmed that this was a previously undescribed species and that the larvae differed from *C. similis* by size and tergal patterning as well as other differences. The adults of *C. similis* are presently unknown. This new species is described here from the larvae and the adult male and female stage as *Camelobaetidius variabilis*, new species.

All specimens were collected by the author and reside in the author's personal collection (NAW) unless otherwise indicated. Institutions housing the

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other materials used in this study and acronyms are as follows: Brackenridge Field Laboratory, University of Texas at Austin (BFL), Purdue Entomological Research Collection (PERC), University of North Texas Entomology Museum (UNTEM), and the United States National Museum of Natural History (USNM). Life stage and material abbreviations are as follows: L-larvae, M-adult male, F-adult female E- larval exuvia slide mounted in Euparal.

### *Camelobaetidius variabilis*, NEW SPECIES

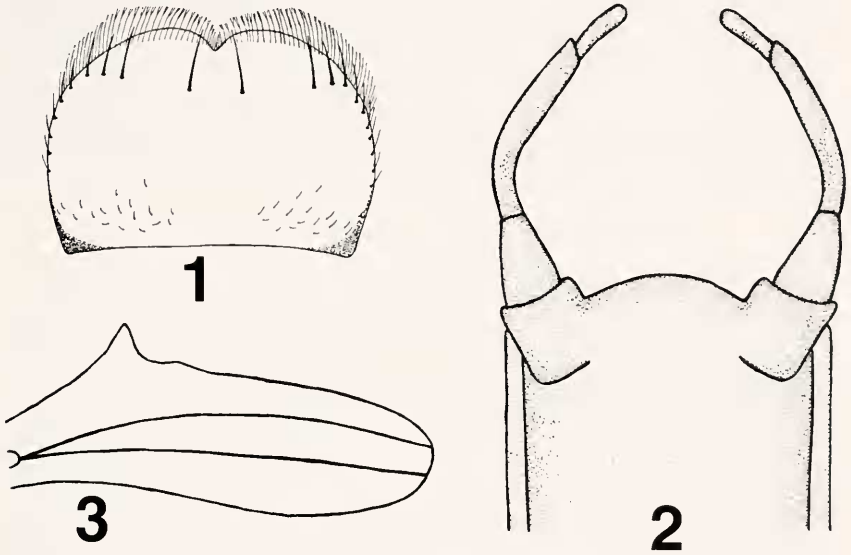
(Figs. 1-4)

**Larva.** (in alcohol) Body length: 5.6-7.0 mm; caudal filaments: 2.4-3.2 mm. Head: Coloration pale with area along coronal and frontal sutures pale olive-brown. Vertex pale olive-brown. Ocelli black. Turbinate portion of eyes in males reddish brown to orange-yellow, lateral lobes black. Antennae pale; sensilla not apparent. Labrum (Fig. 1) sclerotized posterolaterally, with one submedial and two to three submarginal simple setae on each side; intermediate setae absent. Right mandible 3 + 1 + 3 denticles; tuft of simple setae between prostheca and molar. Left mandible 3 + 1 + 3 denticles with short, broad process at base of molar. Maxillae robust; maxillary palps extending to galealacinia; palpal segment 2 broad about 0.5-0.75 length of segment 3. Labium robust; palpal segment one long; segment two shorter than one, with four to five simple setae dorsally and broad, rounded distal projection; segment three rounded apically, with numerous fine, simple setae; glossae with 10-11 simple setae medially, three to four dorsally and four to five laterally; paraglossae with five to six simple setae dorsally and two rows of simple setae distally. Thorax: Color pale to olive-brown with distinct pattern in live larvae (Fig. 4), faint in preserved specimens. Sterna pale to pale yellowish. Osmobranchia present on fore- and midcoxae. Legs pale; femora rounded and often darkened distally with numerous fine, long, simple setae dorsally and pale olive-brown area medially. Tibiae armored ventrally with short, robust, simple setae; tarsi distinctly darken distally with row of short, simple setae ventrally with distal 2-3 about 1.5-2 times the length of preceding setae. Tarsal claws with 5-9 denticles (rarely 9, see discussion) similar to Figs. 13, 15 & 16 in Allen and Chao (1978). Abdomen: Color pale olive-brown; Terga with olive-brown coloration faint on segments 4-5, 7 and posterior half of 10, with prominent submedian oblique markings and often a round pale area medially on each segment. Gills on segments 1 & 7 small and without tracheation; those on segments 2-6 usually with very little or no tracheation. Paraprocts with seven to eight spines. Caudal filaments pale, often darken distally with numerous, fine, simple setae. Median caudal filament subequal in length to cerci.

**Adult Male.** (in alcohol) Body length excluding cerci: 5.6-6.2 mm; forewings: 5.6-6.0 mm; hindwing: 1.0 mm; cerci: 8.8-9.2 mm. Body brownish tan, darkest at head, thorax, and abdominal terga 7-10. Head: Turbinate portion of eyes orange-yellow, semi-elliptical, well separated and slightly divergent. Antennae pale. Thorax: Pronotum darker laterally. Legs pale. Wing veins and membrane hyaline. Hindwings as in Fig. 3. Abdomen: Terga distinctly darker than sterna. Terga brownish tan with segments 2-6 paler than segments 1 & 7-10. Usually darker laterally giving the appearance of a wide pale median line dorsally. Tracheation along pleura usually prominently darkened, but sometimes only faintly darkened. Sterna pale. Genitalia pale and as in Fig. 2. Cerci usually entirely pale, but sometimes with dark articulation in basal segments.

**Adult Female.** (in alcohol) Body length excluding cerci: 5.6-6.2 mm; forewings: 5.8-6.2 mm; hindwing: 1.0 mm; cerci: 7.0-7.5 mm. Body coloration as in male with terga distinctly darker than sterna. Abdominal segments 2-6 not distinctly paler than segments 1 & 7-10, due to presence of eggs. Hindwing as in Fig. 3. Legs and cerci light tan.

**Diagnosis.** The larvae of *C. variabilis* are most similar to *C. similis* but can be separated from it by having a single thread-like gill on the midcoxae as well as forecoxae, labral setation lacking intermediate setae (as in Fig. 1), and tergal patterning (as in Fig. 4). In addition, *C. variabilis* also differs from *C. similis* by different mandibular denticulation and a greater number of marginal spines of the paraprocts, but these latter difference are of inconsistent diagnostic value. The larvae of *C. variabilis* are also very similar to *C. mexicanus* and



Figs. 1-3. *Camelobaetis variabilis*, n. sp.: 1. Labrum, dorsal view. 2. Male genitalia, ventral view. 3. Left hindwing.



Fig. 4. Live male larva of *Camelobaetis variabilis*, n. sp. from Devils River, Texas. Scale bar equals 1 mm. Photograph C.R. Nelson.

*C. waltzi* McCafferty, and in fact share similar labral shape and setation patterns. However, *C. variabilis* is easily separable by the presence of the coxal gills discussed above. In addition, *C. variabilis* is further separable from *C. waltzi* by having a rounded second segment of the labial palps, whereas *C. waltzi* has a medially pointed second segment of the labial palps. The larvae of *C. waltzi* also tend to have short, broad maxillary palps but this feature is of inconsistent diagnostic value. *Camelobaetidius warreni* is also similar to *C. variabilis* with respect to size and tarsal claw denticulation, but *C. warreni* lacks coxal gills and has labral setation with intermediate setae as in Fig. 6 Lugo-Ortiz and McCafferty (1995).

Using the most recent key (Lugo-Ortiz and McCafferty 1995), the larvae of *C. variabilis* will key as *C. similis*. The following added couplet can be used to separate the larvae of these two species at that point in the Lugo-Ortiz and McCafferty key.

#### Couplet to separate larvae *C. variabilis* from *C. similis*

- |  |                   |
|--|-------------------|
| 1. Coxal gills present on forecoxae only; labral setation as in Fig. 5 in Lugo-Ortiz and McCafferty (1995) ..... | <i>similis</i>    |
| 1' Coxal gills on fore and middle coxae; labral setation as in (Fig. 1 herein) .....                             | <i>variabilis</i> |

According to Traver and Edmunds (1968) only *Dactylobaetis* sp. B described from Metlac (Vera Cruz?), Mexico and *C. warreni* (*C. zenobia* and *C. cepheus* were synonymized with *C. warreni* in Lugo-Ortiz and McCafferty 1995), are the only species known in the adult stage in North and Central America which possess a darker terga than sterna. Adult males of *D.* sp. B can be separated from *C. variabilis* by having semi-opaque abdominal segments 2-6 with tracheae not darkened and large turbinate eyes that are contiguous dorsally. I have found no reliable characters for the separation of adults of *C. warreni* from *C. variabilis*.

**Known distribution.** USA: Oklahoma, Texas; MEXICO: Nuevo Leon, Tamaulipas.

**Material examined.** HOLOTYPE: Male larva, USA: TEXAS: Williamson Co., Georgetown, San Gabriel River, riffles below San Gabriel Park, 20 Jan 1997 (USNM). ALLOTYPE: Female larva, same data and deposition as holotype. PARATYPES: One male and one female larvae same data as holotype (PERC). ADDITIONAL PARATYPES: Three male and five female larvae, USA: TEXAS: Comal Co., Guadalupe River about 11 mi., below Canyon Dam, 09 Nov 1996, same deposition as holotype.

**Other Material Examined.** USA: TEXAS: Comal Co., Guadalupe River about 12.5 mi., below Canyon Dam, 16 Feb 1997 (8M, 3F, 4E); same location as before, but 21 Feb 1997 (7M, 2F). USA: TEXAS: COMAL CO., Guadalupe River about 11mi. below Canyon Dam, 17 Feb 1997 (L); same location as before, but 21 Mar 1997 (10 M, 3F). USA: TEXAS: Travis Co., Austin, Little Walnut Creek at Cameron Rd., 25 Mar 1997 (L); same location as before but 12 Apr 1997 (L). USA: TEXAS: WILLIAMSON CO., Tejas Camp, unnamed creek flowing into San Gabriel River, 19 Dec 1996 (L). USA: TEXAS: BASTROP CO., McKinney Roughs, Colorado River at Wilbarger Bend, 23 Nov 1996 (L). USA: TEXAS: VAL VERDE CO., Devils River, Dolan Falls Preserve, 27-29 Oct 1996 (L). USA: TEXAS: Edwards Co., Nueces River,

Barksdale, Hwy 55, 15 Mar 1993 C.R. Nelson, K.D. Alexander & S.M. Stringer (L; BFL). USA: TEXAS: Val Verde Co., Dolan Creek upstream from Devils River, 19 Mar 1993. C.R. Nelson, K.D. Alexander & S.M. Stringer (L; BFL). USA: TEXAS: Val Verde Co., Devils River at Dolan Falls Preserve, above falls, 13 Nov 1993 C.R. Nelson, K.D. Alexander & S.M. Stringer (L; BFL). USA: TEXAS: TRAVIS CO., Walnut Creek at I-35, 06 June 1995 (L); same data but Bull Creek near Spicewoods Spring Road, 12 May 1995 (L). USA: OKLAHOMA: Murray Co., Davis, Honey Creek at Turner Falls Park, 14 Oct 1993, P.F. Wagner (2M, 3F, L; UNTEM). MEXICO: NUEVO LEON: Pabillo River at St. Hwy 115, near Linares, 15 May 1995, D.E. Baumgardner & B.C. Henry (L; UTEM). MEXICO: NUEVO LEON: Pilon River at unnamed road, across from General Teran, off St. Hwy 35, 15 May 1995, D.E. Baumgardner & B.C. Henry (L; UTEM). MEXICO: TAMAULIPAS: Branch of Chihue River at Hwy 101, ca. 12 mi S of Juamave, between kilo marker 91 & 92; 17 May 1995, D.E. Baumgardner & B.C. Henry (L; UTEM).

**Etymology.** The specific epithet is a Latin word meaning changeable. It is a reference to the apparent changeability in tarsal claw denticulation in early instars of this species and possibly the genus as a whole, see discussion.

## DISCUSSION

Tarsal claw denticulation is variable in this species, but it most commonly exhibits 5-6 denticles, with 7-8 being less common. Of the approximately 300 larvae and exuvia examined by the author, one exuvia had 9 denticles on the tarsal claw of one of the metathoracic legs. Due to the variability in tarsal claw denticulation this character will not be useful in separating this species from the known species with 10 or less denticles on their tarsal claws unless specimens are collected in series.

A life history study of *C. variabilis* has been conducted by Paul Wagner (Virginia Tech), and he has indicated to me that in early instars of this species there is a greater number of denticles per tarsal claw than is seen in the later instars and that a reduction in the number of denticles occurs within the first few instars. Similar observations in tarsal claw development have been made in species within the Family Heptageniidae, (see Traver and Edmunds 1968, pg. 638; Ide 1935).

In Allen and Chao (1978) *C. mexicanus* was reported in Texas for the first time as *Dactylobaetis mexicanus* (see McCafferty and Waltz 1990 for discussion on nomenclature change). The authors also presented a brief description of these specimens, in which they stated that the tarsal claw denticulation was of the *warreni* type 5-8 denticles. The original description of *C. mexicanus* found in Traver and Edmunds (1968) states that the tarsal claws of *C. mexicanus* have 5-6 denticles, this feature was also found to be consistent by Lugo-Ortiz and McCafferty (1995) in their review. This, along with the general tergal patterning described by Allen and Chao (1978), suggests to me that their specimens were in actuality *C. variabilis*. This also calls into question many of the previous reports attributed to *C. mexicanus* in Texas.

*Camelobaetidius mexicanus* was reported in Oklahoma for the first time by Reisen (1975) from Honey Creek in Murray County. I have examined

specimens from this location provided to me by P.F. Wagner (Virginia Tech) that are clearly *Camelobaetidius variabilis*.

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